Track Occupation

As soon as you automate your railway or you want to see where the trains are located on the railway, you require track occupation.

Track occupation or shortly feedback will come in many variants. You require these feedbacks regardless if you ride conventionally or digitally.
Perhaps the first question should be what is the simplest (economic) way to achieve this?
This question is NOT simply to answer, because it is rather dependent which brand you have.
I.e. do you have 2-track, 3-track, N, H0 or track I.

Let's start with 3-rail, as 3-rail is only available in H0 and is easily made suitable for feedback, by cutting one side of the track (only Märklin K- track). The wheels act like a conductor to connect the isolated parts of the track with the other track. This method is suitable for conventional as digital model railway.

Advantage:
- Simple
- Economic
- Reliable

Disadvantage:
With long feedback the power supply is less reliable (one track is mass). This point is an important disadvantage, so long feedback is not recommended.

This form of feedback is only useful if the feedback works <u>as a "pulse contact"</u>, i.e. one pulse or more pulses (if a train rides on the track the feedback works like a pulse contact) and it is sufficient to switch something.

Feedback for 2-track systems is a bit more difficult. You can choose reed-contacts, but the mounting of the contacts is not always practical. Also the mounting of the magnet gives several problems, because the contact must works for 100 %. For N-track this is more complicated.
In addition, not everyone likes the glass tubes between the tracks.
Reed-contacts are only useful when the switch action consists of a single pulse. A second option is an optical detection. This way is a perfect solution for those who do not like to cut in the tracks.
You must drill a hole of 6 mm between the tracks (for H0 exactly between two sleepers) and the sensor will be placed in the hole, the result is almost invisible. This solution is unfortunately not cheap, because the average model railway has a lot of these contacts.

Note: If you have the FALLER CAR SYSTEEM on your model railway than this optical detection is the perfect way to automate this system (points and stopping-places). You require only a few optical detections.

The only elegant solution for 2-track systems is CURRENT DETECTION. In principle you can also choose this solution for 3-track systems, but the interruption must be very short, i.e. <u>not longer than one wheel length.</u>
By means of current detection you do not have this problem, hence the riding properties will not be affected. This is important for riding slowly.
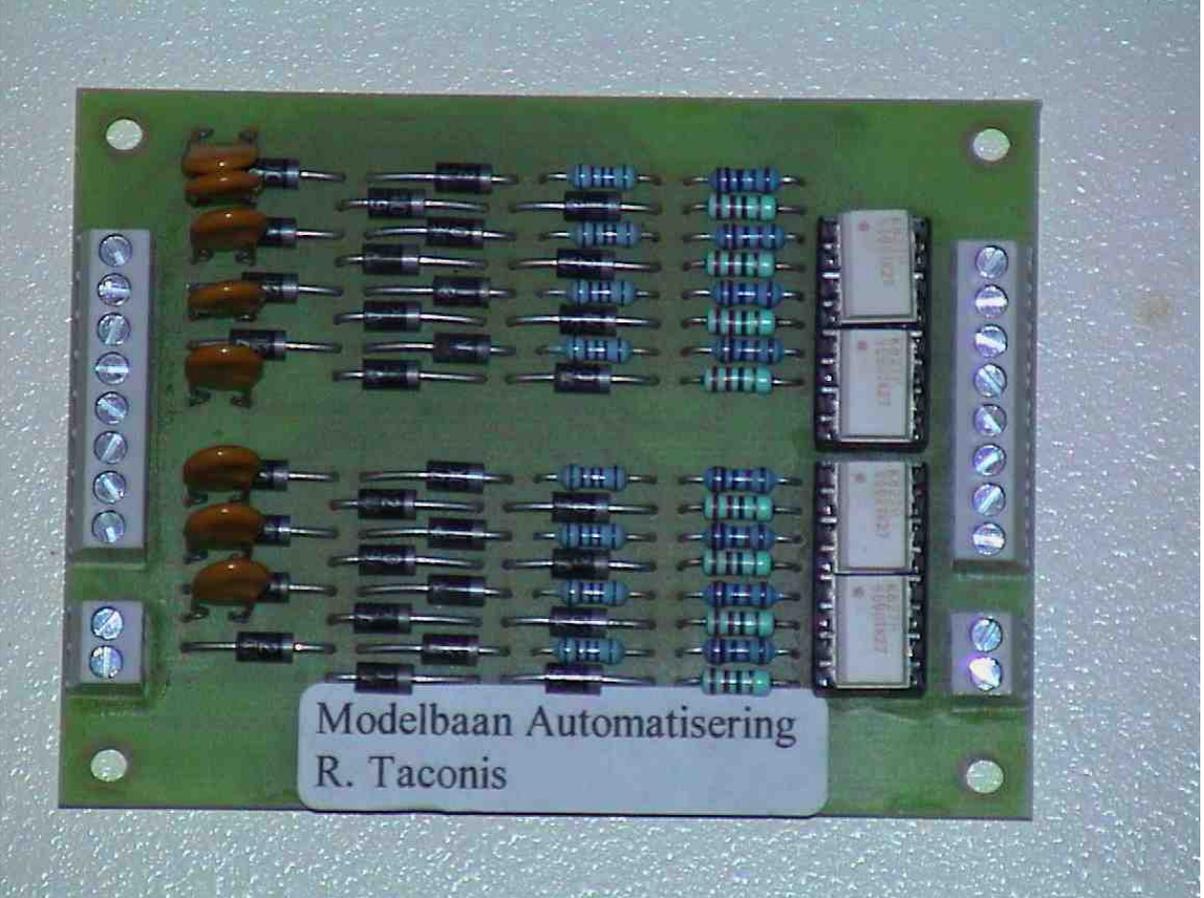
Modelbaan Automatisering
R. Taconis

Summary of detection options for 2-track systems:

Detection	Current	Reed contact	Optical	Cutting
Contact	Pulse/continual	Pulse	Pulse	Pulse
Workmanship	Almost invisible	Visible	Almost invisible	Almost invisible
Cost	Fair	Economical	Expensive	Free

Current detection is the finest solution, because you can decide the length of the detection by yourself.
In addition, the detection is continuing, both for riding as stationary. This way of feedback is not always necessary, but has a few advantages:
- Detection of last wagon (providing current conducting)
- Detection of all blocks or part of those, i.e. every part of the track, which is isolated, will become a feedback. So each train wherever it is located will be detected. This in contrast with the detection form of 3-track.

Connection of feedback (track occupation) on the digital system:

MÄRKLIN
Contacts can be of the pulse type or the continual type. The S88 will memorise the contact till it is read out. MÄRKLIN commonly uses a 3-track system, so the contacts are made simply. You can choose long or short contacts (track interruption). The preferred option is short contacts because the power distribution stays stable. Current detection is a good alternative, certainly with the M or C track (middle track will be interrupted). Also you do not have to damage the track.

LENZ
Contacts can be of the pulse type or the continual type. The LR100 will not memorise the contact. Very short pulses (contact duration) can give problems with computer control, because these pulses would not be recorded.
Short contacts (reed contacts or short track interruptions) are not recommended. Current detection is the best option because the riding properties will not be adversely affected.

TRIX
These contacts can be long or short, because the TRIX track occupation works with current detection.

FMZ
This digital system does not support feedback.

Note: Current detection is the best option for all track systems.

Alternative:
You are not limited to the above mentioned options, if you have the correct software set-up.
SOFT-LOK is yet the single program to support feedback, which do not work with any digital system. What are the benefits of this?
- Quicker
- Reliable (with regard to serial read out with a digital system)
- The digital system will be less charged (only sending commands)

To connect feedback "direct" at your PC, you require some hardware:
1) PC I/O card (PCI)
2) Interface (optical) or interface (adapter) with current detection card
3) Flat cable to connect these cards

Price-list:

Depending of the type of track occupation feedback, you require the optical interface or the adapter interface.
The optical interface provides isolated connection between model railway and computer. Hence a short circuit can not damage your computer. With this card you can connect switches (in any form).
The adapter interface splits out 50 wires to connect easily to the current detection card. In combination with this card you have also an isolated connection between model railway and computer.

Note: If you ride with LENZ digital, current detection has the preference, because the feedback of LENZ (LR-100) is will not be memorised (this is in contrast with the S88 of MÄRKLIN) till the computer reads out this information. Feedback in combination with reed contact will not work properly.

We can supply you an 8 channel track occupation module (current detection) which among other things is suitable for connection directly to the LR-100 (LENZ). This module has 8 optical outputs, so it can be applied universally.

Train detection takes place riding as well during stationary and is protected against short circuit.

On the next page you will see examples how you connect feedback.

Current detection (STM-8) will be used as track occupation and connected via an adapter interface to the PC I/O card (192 inputs). In principle the current detection (STM-8) can be connected to the optical card too, but this is not necessary. Both cards have their own optical separation.
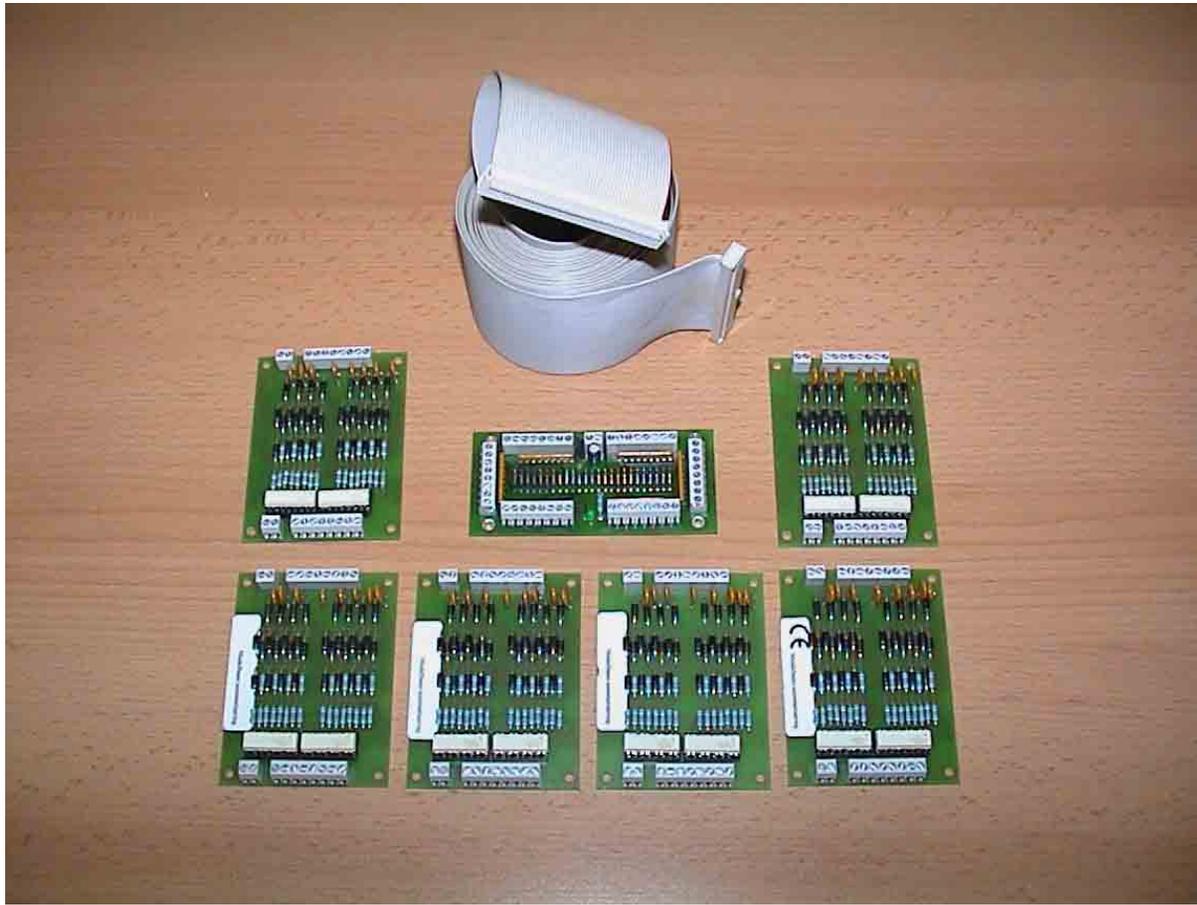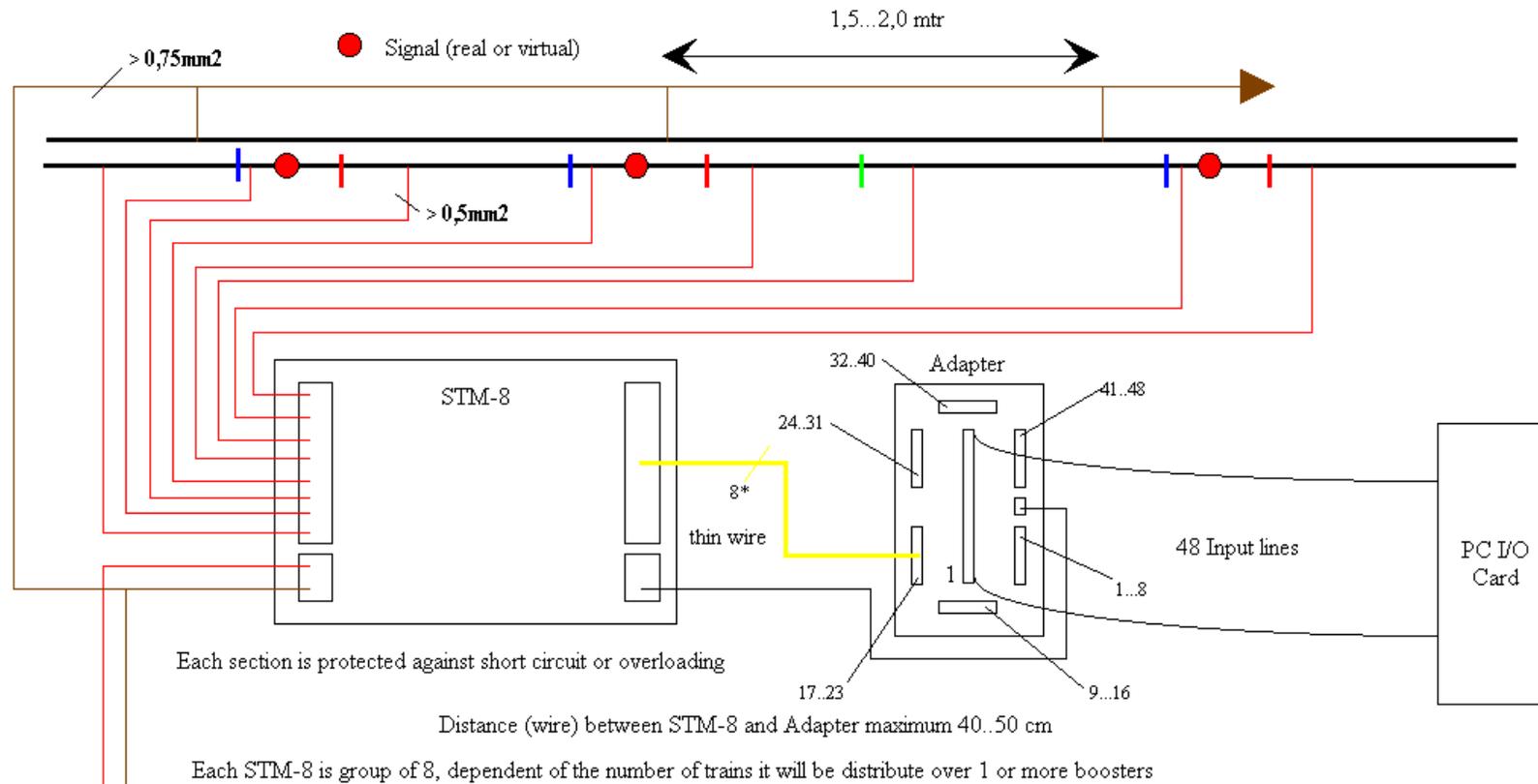
Principle of wiring diagram for feedback with Current Detection

Note: isolation will be made in the middle rail (3-rail system)
Isolation will be made on one side (2-rail system)

| isolation for dividing of one block in 2 or 3 feedback parts (distance to signal about 15...20 CM for H0)

1,5...2,0 mtr

> 0,75mm2

● Signal (real or virtual)

> 0,5mm2

STM-8

Adapter

32..40

41..48

24..31

8*

thin wire

1

17..23

9..16

1..8

48 Input lines

PC I/O
Card

Each section is protected against short circuit or overloading

Distance (wire) between STM-8 and Adapter maximum 40..50 cm

Each STM-8 is group of 8, dependent of the number of trains it will be distribute over 1 or more boosters

Controlunit/Booster